SECTION 02512

INTEGRAL COLORED CONCRETE
06/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 224	(1968; Rev. 1974) Protective Coatings for Portland Cement Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1985) Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
ASTM A 615	(1987) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616	(1987) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 617	(1987) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM C 31	(1990) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1990) Concrete
ASTM C 33-86	Concrete Aggregates
ASTM C 143	(1990) Slump of Portland Cement Concrete
ASTM C 150-86	(1989) Portland Concrete Cement
ASTM C 171	(1969; R 1986) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 173	(1978) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(1989a) Air Content of Freshly Mixed concrete by the Pressure Method
ASTM C 260	(1986) Air-in-training Add Mixtures for Concrete

ASTM C 309	(1989) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 493	(1986) Standard Specification Chemical Add Mixtures for Concrete
ASTM C 979-82	(1986) Pigments for Integrally Colored Concrete
ASTM D 1751	(1983) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1850	(1974; R 1979) Concrete Joint Sealer, Cold-Application Type

FEDERAL SPECIFICATIONS (FS)

FS CCC-C-467	(Rev. C) Cloth, Burlap, Jute (or Kenaf)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Test Reports; FIO.

Copies of all test reports for tests specified in paragraphs "CONCRETE" and "FIELD QUALITY CONTROL" shall be submitted within 24 hours of the completion of the test.

Test Plots; GA

Contractor shall provide test plots for color concrete bands (minimum of 6 l.f.) and a raised concrete planter section (2 ft. ht. by 4 ft. long) for color and finish (sand blast) approval and quality control.

Mix Design; GA

Contractor shall submit representative compressive strength test data for approval 30 days prior to work.

SD-18 Records

Records; FIO

Copies of certified delivery tickets for all color compounds and concrete

used in the construction shall be submitted.

1.4 WEATHER LIMITATIONS

1.4.1 Placing During Cold Weather

Concrete placement shall be discontinued when the air temperature reaches 40 degrees F and is falling. Placement may begin when the air temperature reaches 35 degrees F and is rising. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement shall be approved in writing. Approval shall be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.4.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

1.5 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.5.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.5.2 Straightedge

The Contractor shall furnish and maintain at the jobsite, in good condition one 10-foot straightedge for testing the concrete surface. The straightedge shall be made available for Government use. The straightedge shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, reinforced to insure rigidity and accuracy. Straightedge shall have handles to facilitate movement on the concrete surface.

PART 2 PRODUCTS

2.1 CONCRETE

2.1.1 Integral Color Concrete

Concrete shall conform to the applicable requirements of Section: 03300

CONCRETE FOR BUILDING CONSTRUCTION except as otherwise specified. Colored concrete shall have an integral color of "Sunset Rose," Davis Colors or approved equal. Mix and formulation shall be as per manufacturer specifications. Finish shall be a medium sand blast finish for all exposed surfaces as noted on details.

2.1.1.1 Compression Strength

Concrete shall have a minimum compressive strength of 3000 psi at 28 days. The maximum size of aggregate shall be as per integral color manufacturer specifications.

2.1.1.2 Air Content

Mixtures may have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.1.3 Slump

The concrete slump shall be 2 inches plus or minus 1 percent where determined in accordance with ASTM C 143.

2.1.2 Pedestrian Traffic Concrete

2.1.2.1 Compression Strength

Pedestrian traffic concrete shall have a minimum compressive strength of 3000 psi at 28 days. The maximum size of aggregate shall be 1 inch minus. Vehicular traffic concrete bands shall have a compression strength of 4000 psi at 28 days. The maximum size of aggregate shall be 1 inch minus.

2.1.2.2 Air Content

Mixtures may have air content by volume of concrete of 3 to 5 percent, based on measurements made immediately after discharge from the mixer.

2.1.2.3 Slump

The concrete slump shall be 2 inches plus or minus 1 percent where determined in accordance with ASTM C 143.

2.2 INTEGRAL COLOR CONDITIONER (Not Applicable)

2.3 CONCRETE CURING

2.3.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.3.2 Burlap

Burlap shall conform to FS CCC-C-467.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed

fiberboard.

2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8-inch thick, unless otherwise indicated.

2.5 FORM WORK

Form work shall be designed and constructed to insure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.5.1 Flatwork Forms

Flatwork forms shall be of a height equal to the full depth of the finished pavement.

2.5.2 Planter Forms

Forms shall be built-in place or pre-fabricated in custom panels as required. All steel reinforcement installed shall be as per plans.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement.

3.1.1 Concrete Subgrade

The subgrade shall be tested for grade and cross section with a template extending the full width of the pavement and supported between side forms.

3.1.2 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

3.2 FORM SETTING

Forms shall be carefully set to the indicated alignment, grade and

dimensions. Flatwork forms shall be held rigidly in place by a minimum of three stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Bands

Forms for bands shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10-foot long section. After forms are set, grade and alignment shall be checked with a 10-foot straightedge. Forms shall have a transverse slope as indicated with the low side adjacent to other pavement. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.2 Cast-in Place Concrete Planters

Coordinate work with adjacent structure installation, after steel reinforcing installation, forms for planters shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 6-foot long section. After forms are set, grade and alignment shall be checked with a 10-foot straightedge. Forms shall be set level at all corners. Side forms shall not be removed for 12 hours after finishing has been completed.

3.2.3 Fountain Footing

After steel reinforcing installation, forms for footings shall be set with the upper edge true to line and grade with an allowable tolerance of 1/16 inch in any section. Coordinate fountain piping and access trough location. After forms are set, grade and alignment shall be checked with a straightedge and level. Forms shall be set level at all edges. Side forms shall not be removed for 12 hours after finishing has been completed.

3.3 CONCRETE PLACEMENT AND FINISHING

3.3.1 Placement

After installation of steel reinforcing where specified, concrete shall be placed in the forms in one layer of such thickness that when consolidated and finished the bands, planters, and fountain footing will be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the exposed surface shall be finished to grade with a wood float, bull float, or darby, edged and finished as specified.

3.3.2 Concrete Finishing

Exposed surfaces shall be screeded and floated with a smooth wood float until true to grade and section and is uniform in texture and free from

irregularities.

3.3.2.1 Bands:

For concrete bands all exposed surfaces shall be medium sand blast finished as per industry standards and manufacturer's recommendations.

3.3.2.2 Cast-in Place Concrete Planters:

All exposed surfaces shall be medium sand blast finished as per industry standards and manufacturer' recommendations. Recessed accent band shall be primed and painted as per plans.

3.3.2.3 Fountain Footing:

Only exposed sides to be medium sand blast finished as per industry standards and manufacturer's recommendations. Top surface shall be leveled and smooth troweled finished. See also Section 02820.

3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished carefully with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

3.3.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 0.25 inch.

3.5 FLATWORK JOINTS

Flatwork joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width up to a maximum of 15 feet on centers, and in no case shall the ratio of length to width exceed 1.25 to 1. The contraction joints and the expansion joints will be constructed as shown on the drawings. Transverse expansion joints shall be installed at sidewalk returns. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

3.5.1 Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise e approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to the depth indicated.

3.5.2 Expansion Joints

Transverse expansion joints shall be installed at sidewalk returns. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated or at intervals of not less than 30 or more than 50 feet.

Expansion joints shall be formed with 3/8-inch joint filler strips. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch.

3.7 CURING AND PROTECTION

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period. Curing methods can be the Mat Method (Burlap), Impervious Sheeting Method, and White pigmented Membrane Curing Compounds. Any method used shall be subject to approval of the Contraction Officer.

3.7.1 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction

3.8 FIELD QUALITY CONTROL

The Contractor shall perform the inspection and tests in accordance to the Construction Control Manual. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficiency in thickness by more than 0.25 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work and

approved test plots shall be removed and replaced.

3.10 REMOVAL AND REPLACEMENT OF DEFECTIVE CONCRETE

Defective or damaged concrete shall be removed and replaced as specified herein, and a method of curing shall be employed as directed. All removed concrete shall be replaced with concrete of the thickness and quality required by these specifications. In no case shall the removal and replacement of concrete result in a slab less than the full sidewalk or curb and gutter width or a joint less than 5 feet from a regularly scheduled transverse joint. The defective concrete shall be removed carefully so that the adjacent section is not damaged. When a portion of the unfractured slab is replaced, a full depth saw cut shall be made transversely across the slab in the required location, and the concrete shall be removed to provide a vertical face in the remaining portion of the slab. Prior to placement of the fresh concrete, the face of the slab shall be cleaned of debris and loose concrete. Transverse joints of the replaced slab or portion thereof shall be constructed as indicated. The joints shall be sealed as specified. Removal and replacement of defective or damaged concrete shall be accomplished by the Contractor at no additional cost to the Government

3.11 CONSTRUCTION QUALITY CONTROL

Attention is directed to Section 01451 CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

-- End of Section --